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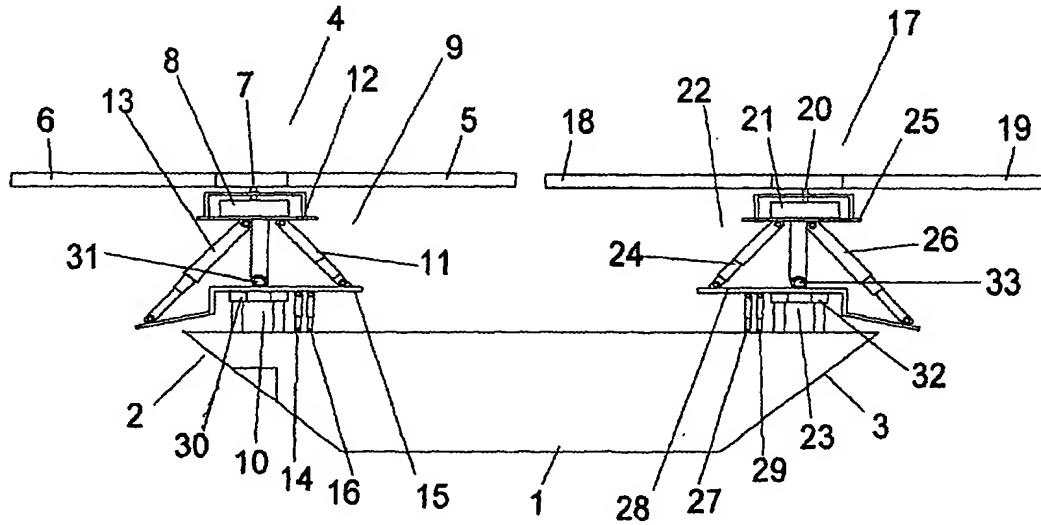
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(54) Title: TANDEM POWERED POWER TILTING AIRCRAFT



(57) Abstract: Vertical take-off aircraft (1) has first (4) and second (17) lifting means (eg helicopter-type rotors, jets, turboprops) arranged in tandem, either above or outboard of ends (2, 3). Lifting means (4, 17) are independently tiltable, in multiple directions, by hydraulic rams (11, 13, 14, 16, 24, 26, 27, 29) to manoeuvre aircraft (1). In particular first lifting means (4) may be tilted in the opposite transverse direction to second lifting means (17) so as to alter the direction of flight. First lifting means (4) may be tilted by further hydraulic rams so that its rotor lies in a vertical plane for forward flight of aircraft (1).

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TANDEM POWERED POWER TILTING AIRCRAFT

This invention relates to the vertical take-off field of aviation.

Many versions of helicopters using tandem rotors have been 5 constructed to date. What has been common to all such helicopters is that the lifting rotors have had to have variable pitch blades to allow control of the helicopters.

This invention provides an aircraft that can fly in a similar manner to a conventional tandem rotor 10 helicopter but does not require a blade pitch varying mechanism.

The aircraft has a main body that is longer than it is wider, a lifting mechanism at the front, which is the primary lifting mechanism, and another lifting mechanism 15 at the rear, which is a secondary lifting mechanism.

The primary lifting mechanism is joined to the forward part of the main body of the aircraft by a tilt enabling joint, and the secondary lifting mechanism is joined to the aft part of the main body of the aircraft by another tilt 20 enabling joint.

The tilt enabling joints provide the means to position the lifting mechanisms above the main body of the aircraft and the means to tilt the primary and secondary lifting mechanisms in a plurality of directions and angles in a controlled manner relative to the main body of the aircraft. Referring to the tilt enabling joint that can tilt the primary lifting mechanism as a primary tilt enabling joint, the primary lifting mechanism can be tilted forward, rearward, and from side to side with respect to the main body of the aircraft by means of the primary tilt enabling joint. And referring to the tilt enabling joint that can tilt the secondary lifting mechanism as a secondary tilt enabling joint, the secondary lifting mechanism can be tilted forward, rearward, and from side to side with respect to the main body of the aircraft by means of the secondary tilt enabling joint.

Tilting of the lifting mechanisms is used as a means to control the aircraft instead of varying blade pitches. By using tilting of lifting mechanisms to control the aircraft during flight, combinations of different forms of lifting mechanisms can be used. For example, the front lifting mechanism can be in the form of a rotor with fixed pitch blades and an engine assembly, with the blades able to force air in a downward direction, while the rear lifting mechanism can be a jet engine which can force exhaust gases

directly downward or downward and sideways, depending on the tilting of the jet. By being able to tilt the jet forward and rearward, and from side to side, changes in exhaust direction can be achieved. Sideway directed exhaust can be 5 used to counter the torque of the forward rotor during take off. Because the aircraft has a jet at the rear instead of a rotor, the downwash over the rear part of the body of the aircraft from rotor blades is avoided. As such wings can be fitted to the rear of the aircraft. On conventional 10 helicopters wings have been proven to be useless due to downwash from rotor blades. With wings fitted to the current invention, the aircraft could gain substantial lift during high speed forward flight, reducing the need to rely on the jet at the rear for lift. By fitting the forward lifting 15 rotor and engine to the main body of the aircraft with multiple tilt enabling joints, the forward lifting mechanism could be tilted 90 degrees forward during forward flight, thus overcoming the need for a counter torque mechanism during high speed forward flight. The jet can then be tilted 20 into a horizontal position, adding to forward propulsion. The aircraft in effect can be transformed into a high speed forward flying aeroplane, using a massive sized rotor at the front acting as a propeller on an aeroplane and a jet at the rear for forward propulsion. The wings would provide

lift, and ailerons on the wings could counter the torque from the main rotor during high speed forward flight.

With the primary lifting mechanism at the front of the aircraft comprising a rotor with a plurality of blades connected to the 5 rotor, and the rotor being rotated by an engine assembly to force air to travel in a downward direction, the engine assembly can consist of a single engine or a plurality of engines.

Since the rotor blades don't have to be varied as in a 10 conventional helicopter, a simple option could be to use a turboprop as the primary lifting mechanism, positioned on the primary tilt enabling joint such that during take-off air is forced in a downward direction by means of the blades that form part of the turboprop.

15 While the secondary lifting mechanism can in one form be a jet engine, it can in another form be a rotor with a plurality of blades connected to the rotor, with an engine assembly to rotate the rotor, and by rotation of the rotor force air in a downward direction by means of the blades as the blades travel 20 around the rotor. The engine assembly can be a single engine or a plurality of engines. In another form the secondary lifting mechanism can be a turboprop.

Hence it becomes apparent that different types of lifting mechanisms can be combined on the aircraft.

In one form of the aircraft the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected 5 to the rotor, with the engine assembly able to rotate the rotor and the blades connected to the rotor such that air can be forced to travel in a downward direction by means of the blades rotating around the rotor, while the secondary lifting mechanism also comprises an engine 10 assembly, a rotor, and blades connected to the rotor, with the engine assembly of the secondary lifting mechanism able to rotate the rotor of the secondary lifting mechanism and the blades of the secondary lifting mechanism connected to the rotor of the secondary lifting 15 mechanism such that air can be forced to travel in a downward direction by means of the blades of the secondary lifting mechanism rotating around the rotor of the secondary lifting mechanism.

In another form of the aircraft the primary lifting 20 mechanism is a turboprop which is positioned on the primary tilt enabling joint such that air can be forced in a downward direction by means of the blades of the turboprop, and the secondary lifting mechanism is a

turboprop, which is positioned on the secondary tilt enabling joint such that air can be forced in a downward direction by means of the blades of the turboprop.

In another form of the aircraft the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, with the engine assembly able to rotate the rotor and the blades connected to the rotor such that air can be forced to travel in a downward direction by means of the blades rotating around the rotor, and the secondary lifting mechanism is a turboprop which is positioned on the secondary tilt enabling joint such that air can be forced in a downward direction by means of the blades of the turboprop.

15 In another form of the aircraft the primary lifting mechanism is a turboprop which is positioned on the primary tilt enabling joint such that air can be forced in a downward direction by means of the blades of the turboprop, while the secondary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, with the engine assembly of the secondary lifting mechanism able to rotate the rotor of the secondary lifting mechanism and the blades of the secondary lifting mechanism connected to the rotor of the secondary lifting mechanism

such that air can be forced to travel in a downward direction by means of the blades of the secondary lifting mechanism rotating around the rotor of the secondary lifting mechanism.

5 In another form of the aircraft the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, with the engine assembly able to rotate the rotor and the blades connected to the rotor such that air can be forced to travel in a downward direction by means of the blades rotating around the rotor, and the secondary lifting mechanism is a jet engine in the form of a turbojet that can be tilted so that exhaust from the turbojet can be forced in a downward direction behind the main body of the aircraft.

15 In another form of the aircraft the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, with the engine assembly able to rotate the rotor and the blades connected to the rotor such that air can be forced to travel in a downward direction by means of the blades rotating around the rotor, and the secondary lifting mechanism is a jet engine in the form of a turbofan that can be tilted so that exhaust from the turbofan can be forced in a downward direction behind the main body of the aircraft.

In another form of the aircraft the primary lifting mechanism is a turboprop which is positioned on the primary tilt enabling joint such that air can be forced in a downward direction by means of the blades of the 5 turboprop, and the secondary lifting mechanism is a jet engine in the form of a turbojet that can be tilted so that exhaust from the turbojet can be forced in a downward direction behind the main body of the aircraft.

In another form of the aircraft the primary lifting 10 mechanism is a turboprop which is positioned on the primary tilt enabling joint such that air can be forced in a downward direction by means of the blades of the turboprop, and the secondary lifting mechanism is a jet engine in the form of a turbofan that can be tilted so 15 that exhaust from the turbofan can be forced in a downward direction behind the main body of the aircraft.

In another form of the aircraft the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, with the engine assembly 20 able to rotate the rotor and the blades connected to the rotor such that air can be forced to travel in a downward direction by means of the blades rotating around the rotor, and the secondary lifting mechanism comprises two jet engines that can be tilted so that exhaust from the

jet engines can be forced in a downward direction behind the main body of the aircraft, with each jet engine being a turbojet.

In another form of the aircraft the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected to 5 the rotor, with the engine assembly able to rotate the rotor and the blades connected to the rotor such that air can be forced to travel in a downward direction by means of the blades rotating around the rotor, and the secondary lifting mechanism comprises two jet engines that can be tilted so that exhaust 10 from the jet engines can be forced in a downward direction behind the main body of the aircraft, with each jet engine being a turbofan.

In another form of the aircraft the primary lifting mechanism is a turboprop which is positioned on the primary tilt enabling 15 joint such that air can be forced in a downward direction by means of the blades of the turboprop, and the secondary lifting mechanism comprises two jet engines that can be tilted so that exhaust from the jet engines can be forced in a downward direction behind the main body of the aircraft, with each jet engine being 20 a turbofan.

In another form of the aircraft the primary lifting mechanism is a turboprop which is positioned on the primary tilt enabling joint such that air can be forced

in a downward direction by means of the blades of the turboprop, and the secondary lifting mechanism comprises two jet engines that can be tilted so that exhaust from the jet engines can be forced in a downward direction behind 5 the main body of the aircraft, with each jet engine being a turbojet.

In one form of the aircraft where the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, with the engine assembly 10 able to rotate the rotor and the blades connected to the rotor such that air can be forced to travel in a downward direction by means of the blades rotating around the rotor, the engine assembly consists of a single engine.

In another form of the aircraft where the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, with the engine assembly 15 able to rotate the rotor and the blades connected to the rotor such that air can be forced to travel in a downward direction by means of the blades rotating around the 20 rotor, the engine assembly consists of two engines.

In one form of the aircraft where the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, and the engine assembly of

the primary lifting mechanism consists of a single engine, a power transmission mechanism is connected to the engine of the primary lifting mechanism, by which power transmission mechanism the respective engine is able to 5 rotate the rotor of the primary lifting mechanism.

In another form of the aircraft where the primary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, and the engine assembly of the primary lifting mechanism consists of two engines, 10 a power transmission mechanism is connected to the engines of the primary lifting mechanism, by which power transmission mechanism the engines of the primary lifting mechanism are able to rotate the rotor of the primary lifting mechanism.

In one form of the aircraft where the secondary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor of the secondary lifting mechanism, the engine assembly of the secondary lifting mechanism 15 consists of a single engine.

In another form of the aircraft where the secondary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor of the secondary lifting mechanism, the engine assembly consists of two engines. 20

In one form of the aircraft where the secondary lifting mechanism comprises an engine assembly, a rotor, and

blades connected to the rotor of the secondary lifting mechanism, and the engine assembly consists of a single engine, a power transmission mechanism is connected to the engine of the secondary lifting mechanism, by which power 5 transmission mechanism the respective engine is able to rotate the rotor of the secondary lifting mechanism.

In another form of the aircraft where the secondary lifting mechanism comprises an engine assembly, a rotor, and blades connected to the rotor, and the engine assembly 10 of the secondary lifting mechanism consists of two engines, a power transmission mechanism is connected to the engines of the secondary lifting mechanism by which power transmission mechanism the engines of the secondary lifting mechanism are able to rotate the rotor of the secondary lifting mechanism.

15 The tilt enabling joints can comprise various components. Some of the components are such that they hold the joint together while allowing the joint to have movement, forming a movement enabling assembly, while other components form an activating mechanism that can force movement between 20 components of the movement enabling assembly.

In one form of the aircraft the movement enabling assembly of the primary tilt enabling joint is a universal joint and the activating mechanism comprises four of hydraulic actuators connected to the movement enabling assembly.

In another form of the aircraft the movement enabling assembly of the primary tilt enabling joint comprises a hinge assembly and the activating mechanism comprises a hydraulic actuating mechanism connected to the movement enabling assembly.

5 In another form of the aircraft the movement enabling assembly of the primary tilt enabling joint comprises two hinges transversely connected and the activating mechanism comprises four hydraulic actuators connected to the movement enabling assembly.

10 In one form of the aircraft the movement enabling assembly of the secondary tilt enabling joint is a universal joint and the activating mechanism comprises four hydraulic actuators connected to the movement enabling assembly.

15 In another form of the aircraft the movement enabling assembly of the secondary tilt enabling joint comprises a hinge assembly and the activating mechanism comprises a hydraulic actuating mechanism connected to the movement enabling assembly.

20 In another form of the aircraft the movement enabling assembly of the secondary tilt enabling joint comprises two hinges transversely connected and the activating mechanism comprises four hydraulic actuators connected to the movement enabling assembly.

In one form of the aircraft the primary lifting mechanism is connected to the main body of the aircraft by the primary tilt enabling joint such that only part of the primary lifting mechanism can be positioned in front of the main body of the aircraft.

5 In another form of the aircraft the primary lifting mechanism is connected to the main body of the aircraft by the primary tilt enabling joint such that the whole of the primary lifting mechanism can be positioned in front of the main body of the aircraft.

10 In one form of the aircraft the primary lifting mechanism is connected to the main body of the aircraft by the primary tilt enabling joint such that only a part of the primary lifting mechanism can be positioned above the main body of the aircraft.

15 In another form of the aircraft the primary lifting mechanism is connected to the main body of the aircraft by the primary tilt enabling joint such that the whole of the primary lifting mechanism can be positioned above the main body of the aircraft.

20 In one form of the aircraft the secondary lifting mechanism is connected to the main body of the aircraft by the secondary tilt enabling joint such that only part of the secondary lifting mechanism can be positioned behind the main body of the aircraft.

In another form of the aircraft the secondary lifting mechanism is connected to the main body of the aircraft by the secondary tilt enabling joint such that the whole of the secondary lifting mechanism can be positioned behind the 5 main body of the aircraft.

In one form of the aircraft the secondary lifting mechanism is connected to the main body of the aircraft by the secondary tilt enabling joint such that only part of the secondary lifting mechanism can be positioned above 10 the main body of the aircraft.

In another form of the aircraft the secondary lifting mechanism is connected to the main body of the aircraft by the secondary tilt enabling joint such that the whole of the secondary lifting mechanism can be positioned above 15 the main body of the aircraft.

In another form of the aircraft an additional tilt enabling joint is used to connect the primary tilt enabling joint to the main body of the aircraft to allow a greater amount of tilting movement between 20 the primary lifting mechanism and the main body of the aircraft. The additional tilt enabling joint, which is a third tilt enabling joint, comprises a movement enabling assembly that is a hinge, and the

activating mechanism comprises two hydraulic actuators connected to the movement enabling assembly and the main body of the aircraft.

In one form of the aircraft the secondary lifting mechanism is pivotly connected to the secondary tilt enabling joint such that the secondary lifting mechanism can be rotated on the secondary tilt enabling joint without the secondary tilt enabling joint having to move. In a form of the aircraft this rotating ability is achieved by means of a metal plate being used to join the secondary lifting mechanism to the upper section of the secondary tilt enabling joint, with the metal plate being joined to the upper section of the secondary tilt enabling joint by means of a large rivet, and an electric motor that turns a wheel is used to rotate the metal plate on the secondary tilt enabling joint, with the electric motor connected to the secondary tilt enabling joint and the wheel.

In another form of the aircraft the secondary tilt enabling joint is connected to the main body of the aircraft such that the secondary tilt enabling joint can be rotated on the aft end of the main body of the aircraft without components of the secondary tilt enabling joint having to move with respect to one another. In a form of the aircraft this rotating

ability is achieved by means of a metal plate being used to join the lower section of the secondary tilt enabling joint to the upper part of the aft end of the main body of the aircraft, with the metal plate being joined to the upper part of the main body by means of a large rivet which protrudes from inside of the main body of the aircraft. An electric motor that turns a wheel is used to rotate the metal plate that the secondary tilt enabling joint is attached to, with the electric motor connected to the upper section of the main body of the aircraft.

10 Figure 1 shows one form of the aircraft according to this invention. The aircraft has a main body 1 with a forward end 2 and an aft end 3. The primary lifting mechanism 4 comprises two blades 5, 6, connected to a rotor 7, which rotor 7 is rotated by means of an engine assembly 8 comprising one engine. The 15 primary lifting mechanism 4 is connected to the top of the forward end 2 of the main body 1 by means of the primary tilt enabling joint 9 which has a movement enabling assembly in the form of a universal joint 10. A hydraulic actuator 11 is able to move the upper section 12 of the primary tilt enabling joint 9 forward and the hydraulic actuator 13 is able to move the upper section 12 of the primary tilt enabling joint in a rearward direction, while another hydraulic actuator 14 is connected to the main body 1 of the aircraft so that it is on the left side of the universal joint 10 and so that it is able 20 to tilt a metal platform 15 which forms part of the universal joint 10 to the right side of the main body (Refer Figure 2).

Another hydraulic actuator 16 is connected to the main body 1 of the aircraft so that it is on the right side of the universal joint and so that it can tilt the metal platform 15 to the left side of the main body of the aircraft. The hydraulic actuator 5 14 is positioned behind the universal joint 10 but is further forward on the main body than is the hydraulic actuator 16. The hydraulic actuators 14 and 16 are connected to the main body 1 and the metal platform 15 that forms part of the universal joint 10. The hydraulic actuators 11 and 13 are 10 connected to the metal platform 15 and the upper section 12 of the primary tilt enabling joint 9. The secondary lifting mechanism 17 comprises blades 18, 19, connected to a rotor 20, which rotor 20 is rotated by means of an engine assembly 21 that comprises a single engine. The secondary lifting mechanism 15 17 is connected to the top of the aft end 3 of the main body 1 by means of the secondary tilt enabling joint 22 which has a movement enabling assembly in the form of a universal joint 23. A hydraulic actuator 24 is able to move the upper section 25 of the secondary tilt enabling joint 22 rearward with respect to 20 the main body 1 and the hydraulic actuator 26 is able to move the upper section 25 of the secondary tilt enabling joint in a forward direction, while another hydraulic actuator 27 is connected to the main body 1 of the aircraft so that it is on the left side of the universal joint 23 and so that it is able 25 to tilt a metal platform 28 which forms part of the universal

joint 23 to the right side of the main body. Another hydraulic actuator 29 is connected to the main body 1 of the aircraft so that it is on the right side of the universal joint 23 so that it can tilt the metal platform 28 to the left side of the main body of the aircraft. The hydraulic actuator 27 is positioned further forward on the main body than is the hydraulic actuator 29. The hydraulic actuators 27 and 29 are connected to the main body 1 and the metal platform 28 that forms part of the universal joint 23. The hydraulic actuators 24 and 26 are connected to the metal platform 28 and the upper section 25 of the secondary tilt enabling joint 22. The universal joint 10 of the primary tilt enabling joint 9 is formed by transversely connecting hinges 30 and 31 by means of the metal platform 15. The universal joint 23 of the secondary tilt enabling joint 22 is formed by 15 transversely connecting hinges 32 and 33 by means of the metal platform 28. The hinges 30 and 32 are joined to the upper part of main body 1 of the aircraft. By forcing air in a downward direction by means of the primary lifting mechanism and the secondary lifting mechanism the aircraft is able to achieve 20 vertical take-off. By tilting the primary lifting mechanism forward by means of the primary tilt enabling joint and tilting the secondary lifting mechanism forward by means of the secondary tilt enabling joint the aircraft is able to achieve forward flight as air is force downward and to the rear of the 25 aircraft by the primary lifting mechanism and secondary lifting mechanism. The primary lifting mechanism and the secondary

lifting mechanism are arranged in tandem order above the main body 1, with the primary lifting mechanism forward of the secondary lifting mechanism. The primary tilt enabling joint and the secondary tilt enabling joint are also in tandem order on top 5 of the main body 1, with the primary tilt enabling joint in front of the secondary tilt enabling joint. The blades of the primary lifting mechanism protrude in front of the forward end of the main body 1.

Figure 2 shows the lower part of the primary tilt enabling 10 joint 9 at the forward end of the main body 1 of the aircraft of Figure 1. The view is from behind and shows the universal joint 10 as it would appear from behind, and the positioning of hydraulic actuators 14 and 16, with hydraulic actuator 14 to the left of the universal joint 10 and hydraulic actuator 16 to 15 the right of the universal joint 10. The hydraulic actuators are connected to the metal plate 15 that forms part of the universal joint.

The hydraulic actuators 27 and 29 of the secondary tilt enabling joint 22 of Figure 1 are distanced in 20 the same manner from the universal joint 23 as the hydraulic actuators 14 and 16 are distanced from the universal joint 10 of the primary tilt enabling joint.

Figure 3 shows another form of the aircraft. The aircraft has a main body 1 as in figure 1, with a forward end 2 and an aft end 3. The primary tilt enabling joint 9 is the same as in Figure 1 and the secondary tilt enabling joint 22 is the same 5 as in Figure 1. The primary lifting mechanism 4 is a turboprop 34 which can force air in a downward direction by means of the blades 35 and 36. The secondary lifting mechanism 17 is another turboprop 37 which can force air in a downward direction by means of the blades 38 and 39.

10 Figure 4 shows another form of the aircraft. The aircraft has a main body 1 with a forward end 2 and rear end 3. The primary lifting mechanism 4 is the same as in Figure 1 and the primary tilt enabling joint 9 is the same as in Figure 1. The secondary lifting mechanism 40 is a jet engine. The jet engine 4 is a 15 turbojet and is attached to a hinge 41. The turbojet 40 is joined to metal plate 42 that forms of the hinge 41. A lower metal plate 43 forms part of the hinge 41. The lower metal plate 43 is connected to another hinge 44 that is positioned longitudinally on top of the main body 1. The lower hinge 44 20 is joined to the the upper part of the main body 1 of the aircraft. The hinges 41 and 44 are transversely connected. A hydraulic actuator 45 is connected to the metal plates 42 and 43 of hinge 41 such that it is able to tilt the turbojet 40 in a rearward direction by pushing the metal plate 42 in a 25 rearward direction. A hydraulic actuator 46 is connected to the

lower metal plate 43 and the upper part of the main body and is connected to the main body 1 of the aircraft so that it is on the left of the lower hinge 44 such that it can tilt the lower plate 43 to the right. Another hydraulic actuator 47 5 is connected to the upper part of the main body and the lower metal plate 43, and is connected to the main body 1 of the aircraft so that it is on the right side of the lower hinge 44 such that it can tilt the lower plate 43 to the left side of the main body 1. The metal plates 42, 43, the hinges 41 and 44, 10 and the hydraulic actuators 45, 46, and 47 form the secondary tilt enabling joint 22. The jet engine 40 is shown to be partly behind the main body 1 of the aircraft angled such that it forces exhaust gases in a downward direction through the rear 48 of the turbojet 40. A turbofan jet engine could be used in 15 place of the turbojet 40 positioned in the same manner as the turbojet 40.

Figure 5 shows the front of lower part of the secondary tilt enabling joint 22 of Figure 4 as viewed from in front of the secondary tilt enabling joint 22. Figure 5 shows the lower 20 hinge 44 connected to the lower plate 43 of Figure 4 and the main body 1 of the aircraft, and the distancing of the hydraulic actuators 46 and 47 from the lower hinge 44.

Figure 6 shows the aircraft of Figure 4 fitted with an additional tilt enabling joint 49, which is a third tilt

enabling joint. Referring to the additional tilt enabling joint as a third tilt enabling joint, the third tilt enabling joint 49 is in the form of a hinge 50 which is connected to the upper part of the forward end 2 of the main body 1 of the aircraft.

5 A hydraulic actuator 51 that forms part of the third tilt enabling joint is able to tilt the upper section 52 of the third tilt enabling joint in a forward direction. The primary tilt enabling joint 9 is connected to the upper section 52 of the third tilt enabling joint and is shown in a state 10 of forward tilt. Hydraulic actuator 53 forms part of the third tilt enabling joint and is able to tilt the upper section 52 of the third tilt enabling joint in a rearward direction. The hydraulic actuator 51 is connected to the upper part of the main body of the aircraft and to a stem 54 which protrudes from the 15 hinge 50. The hydraulic actuator 53 is connected to the stem 54 and the upper part of the forward end 2 of the main body of the aircraft.

Figure 7 shows a modified form of the aircraft of Figure 6, with the third tilt enabling joint 49 in a forward tilt, the 20 primary tilt enabling joint 9 in a forward tilt, and the jet engine 40 in a forward tilt. Figure 7 shows that the whole of the primary lifting mechanism is in front of the main body of the aircraft. In Figure 7 the aircraft is different to the aircraft in Figure 6 in that it has the lower hinge 44 connected 25 to a metal plate 55. The metal plate 55 is connected to a large

rivet 56 which is contained within the main body and protrudes from the main body 1 through an opening 57 in the upper part of the main body. The metal plate 55 is supported on metal blocks 58 and 59 such that the metal plate 55 can be rotated by an 5 electric motor 60 rotating a wheel 61. Hydraulic actuators 46 and 47 are connected to the metal plate 55 and are in the same position with respect to the hinge 44 as they are in the aircraft of Figure 4. Figure 7 also shows a fin 62 attached to the jet engine 40. The jet is shown further behind the aft end 10 of the main body of the aircraft than in Figure 6. The jet engine 40 could now be tilted in rearward direction so that it could be placed behind the main body of the aircraft.

Figure 8 shows the aircraft of Figure 7, now fitted with wheel assemblies 63 and 64. Wings can be fitted to the main 15 body of the aircraft. Figure 6 shows the position of a wing 65 on the left side of the main body of the aircraft.

Figure 9 shows a variation of the aircraft of Figure 4. The upper metal plate 42 of the hinge 41 is longer, the jet engine 40 is attached to another metal plate 66, and a large rivet 67 20 now joins the metal plate 66 to the metal plate 42, which rivet connects the metal plates 42 and 66 such that the metal plate 66 can pivotly rotate with respect to the metal plate 42. A hydraulically activated rotating arm 68 is used to rotate the metal plate 66 with respect to the metal plate 42. The rivet 25 67 and the hydraulically activated rotating arm 68 combined

with the additional metal plate 66 hence form a rotation enabling mechanism by which the jet engine 40 can be pivotally rotated with respect to the secondary tilt enabling joint 22.

Figures 1, 3, 4 and 9 show that the aircraft can take-off 5 and land vertically. Figure 8 shows that the aircraft can also take-off and land as a conventional forward flying aeroplane when fitted with wheels, wings, and when the tilt enabling joints have tilted the primary lifting mechanism and the secondary lifting mechanism forward.

10 The aircraft could take-off while moving forward as an aeroplane and land as a helicopter, and vice versa.

Figure 10 shows another form of the aircraft, with the whole of the primary lifting mechanism 4 now in front of and above the forward end 2 of the 15 main body 1. The secondary lifting mechanism 17 is now completely above and behind the aft end 3 of the main body 1. The primary tilt enabling joint 9 and the secondary tilt enabling joint 22 are combinations of components of tilt enabling joints 20 shown in previous figures. An addition is the extension platform 69 shown in respect of the primary tilt enabling joint 9 and the extension platform 70 of the secondary tilt enabling joint 22.

What I claim as my invention is:

1. An aircraft with a main body, a primary lifting mechanism and a secondary lifting mechanism, which main body has a forward end and an aft end, with the primary lifting mechanism and the secondary lifting mechanism connected to the main body of the aircraft in tandem order, and with the aircraft able to achieve flight by means of upward forces exerted on the main body of the aircraft by the primary lifting mechanism and the secondary lifting mechanism while the primary lifting mechanism and the secondary lifting mechanism are connected to the main body of the aircraft in tandem order,
and which primary lifting mechanism comprises a power plant as a means for providing downwardly extending thrust to the aircraft, and which secondary lifting mechanism comprises a power plant as a means for providing downwardly extending thrust to the aircraft, and which primary lifting mechanism is connected to the main body of the aircraft by a tilt enabling joint such that during flight of the aircraft the primary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the primary lifting mechanism can be tilted in lateral directions relative to the main body of the aircraft during flight of the aircraft, and such that a direction of

travel of the aircraft during flight can be altered by
altering the lateral direction or angle of tilt of the primary
lifting mechanism relative to the main body of the aircraft,
and which said tilt enabling joint is a primary tilt enabling
5 joint, with the primary lifting mechanism able to exert an
upward force on the forward end of the main body of the
aircraft through the primary tilt enabling joint, and which
secondary lifting mechanism is connected to the main body of
the aircraft by an additional tilt enabling joint, which said
10 additional tilt enabling joint is a secondary tilt enabling
joint, and which said secondary lifting mechanism is
connected to the main body of the aircraft by the secondary
tilt enabling joint such that during flight of the aircraft
the secondary lifting mechanism can be tilted in a plurality
15 of directions and angles relative to the main body of the
aircraft, in a controlled manner, and such that the secondary
lifting mechanism can be tilted in lateral directions
relative to the main body during flight of the aircraft, and
such that a direction of travel of the aircraft during
20 flight can be altered by altering the lateral direction or
angle of tilt of the secondary lifting mechanism relative
to the main body, and which secondary tilt enabling joint is
such that the secondary lifting mechanism can be tilted in a
controlled manner in a lateral direction with respect to the
25 main body of the aircraft during flight of the aircraft that

is opposite to a lateral direction that the primary lifting mechanism can be tilted in with respect to the main body of the aircraft by means of the primary tilt enabling joint during flight of the aircraft, and which secondary lifting mechanism is able to exert an upward force on the aft end of the main body of the aircraft through the secondary tilt enabling joint, with the primary tilt enabling joint and the secondary tilt enabling joint connected to the main body of the aircraft, and with the aircraft able to achieve flight by means of an upward force exerted on the main body of the aircraft by the primary lifting mechanism extending thrust in a downward direction and an upward force exerted on the main body of the aircraft by the secondary lifting mechanism extending thrust in a downward direction while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order, and with controlled lateral tilting of the primary lifting mechanism and the secondary lifting mechanism able to occur during flight while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order.

2. An aircraft with a main body, a primary lifting mechanism and a secondary lifting mechanism, which main body has a forward end and an aft end, with the primary lifting mechanism and the secondary lifting mechanism connected to the main body of the aircraft in tandem order, and with the aircraft able to achieve flight by means of upward forces exerted on the main body of the aircraft by the primary lifting mechanism and the secondary lifting mechanism while the primary lifting mechanism and the secondary lifting mechanism are connected to the main body of the aircraft in tandem order,

5 and which primary lifting mechanism comprises a rotor, an engine assembly, and a plurality of blades, with the said blades connected to the rotor, and which said engine assembly is able to rotate the said rotor, with the blades connected to the rotor such that when the rotor is rotated by the said engine assembly air can be forced in a downward direction by means of the blades rotating around the rotor, with the primary lifting

10 mechanism able to exert an upward force on the forward end of the main body of the aircraft by forcing air in a downward direction by way of the blades rotating around the rotor,

15 and the secondary lifting mechanism comprises a rotor, an engine assembly, and a plurality of

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blades, with the blades of the secondary lifting mechanism connected to the rotor of the secondary lifting mechanism, and which engine assembly of the secondary lifting mechanism is able to rotate 5 the rotor of the secondary lifting mechanism, with the blades of the secondary lifting mechanism connected to the rotor of the secondary lifting mechanism such that when the rotor of the secondary lifting mechanism is rotated by the engine assembly 10 of the secondary lifting mechanism air can be forced in a downward direction by means of the blades of the secondary lifting mechanism rotating around the rotor of the secondary lifting mechanism, with the secondary lifting mechanism able to exert an upward force on 15 the aft end of the main body of the aircraft by forcing air in a downward direction by way of the blades of the secondary lifting mechanism rotating around the rotor of the secondary lifting mechanism, and which primary lifting mechanism is connected to the 20 main body of the aircraft by a tilt enabling joint such that during flight of the aircraft the primary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the primary lifting mechanism can be tilted in 25 lateral directions relative to the main body of the aircraft

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 during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by altering the lateral direction or angle of tilt of the primary lifting mechanism relative to the main body of the aircraft, and which said tilt enabling joint is a primary tilt enabling joint, with the primary lifting mechanism able to exert an upward force on the forward end of the main body of the aircraft through the primary tilt enabling joint, and which secondary lifting mechanism is connected to the main body of the aircraft by an additional tilt enabling joint, which said additional tilt enabling joint is a secondary tilt enabling joint, and which said secondary lifting mechanism is connected to the main body of the aircraft by the secondary tilt enabling joint such that during flight of the aircraft the secondary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the secondary lifting mechanism can be tilted in lateral directions relative to the main body during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by altering the lateral direction or angle of tilt of the secondary lifting mechanism relative to the main body, and which secondary tilt enabling joint is such that the secondary lifting mechanism can be tilted in a controlled manner in a lateral direction with respect to the

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main body of the aircraft during flight of the aircraft that is opposite to a lateral direction that the primary lifting mechanism can be tilted in with respect to the main body of the aircraft by means of the primary tilt enabling joint 5 during flight of the aircraft, and which secondary lifting mechanism is able to exert an upward force on the aft end of the main body of the aircraft through the secondary tilt enabling joint, with the primary tilt enabling joint and the secondary tilt enabling joint connected to the main body of 10 the aircraft, and with the aircraft able to achieve flight by means of an upward force exerted on the main body of the aircraft by the primary lifting mechanism forcing air in a downward direction and an upward force exerted on the main body of the aircraft by the secondary lifting mechanism 15 forcing air in a downward direction while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order, and with controlled lateral tilting of the primary lifting mechanism and the secondary lifting mechanism able to occur during flight while the 20 primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order.

3. An aircraft with a main body, a primary lifting mechanism and a secondary lifting mechanism, which main body has a forward end and an aft end, with the primary lifting mechanism and the secondary lifting mechanism connected to the main body of the aircraft in tandem order, and with the aircraft able to achieve flight by means of upward forces exerted on the main body of the aircraft by the primary lifting mechanism and the secondary lifting mechanism while the primary lifting mechanism and the secondary lifting mechanism are connected to the main body of the aircraft in tandem order,
5 and which primary lifting mechanism is connected to the main body of the aircraft by a tilt enabling joint such that during flight of the aircraft the primary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the primary lifting mechanism can be tilted in lateral directions relative to the main body of the aircraft during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by
10 altering the lateral direction or angle of tilt of the primary lifting mechanism relative to the main body of the aircraft, and which said tilt enabling joint is a primary tilt enabling joint,
15 and which secondary lifting mechanism is connected to the main body of the aircraft by a tilt enabling joint such that during flight of the aircraft the secondary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the secondary lifting mechanism can be tilted in lateral directions relative to the main body of the aircraft during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by
20 altering the lateral direction or angle of tilt of the secondary lifting mechanism relative to the main body of the aircraft, and which said tilt enabling joint is a secondary tilt enabling joint,

which primary lifting mechanism is a turboprop, and which primary lifting mechanism is attached to the primary tilt enabling joint such that air can be forced in a downward direction

5 by the primary lifting mechanism, and such that by forcing air in a downward direction the primary lifting mechanism is able to exert an upward force on the forward end of the main body of the aircraft, with the primary lifting mechanism able to exert an upward force on the forward end of the main

10 body of the aircraft through the primary tilt enabling joint, and which secondary lifting mechanism is connected to the main body of the aircraft by an additional tilt enabling joint, which said additional tilt enabling joint is a secondary tilt enabling joint, and which said secondary lifting mechanism is

15 connected to the main body of the aircraft by the secondary tilt enabling joint such that during flight of the aircraft the secondary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the secondary

20 lifting mechanism can be tilted in lateral directions relative to the main body during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by altering the lateral direction or angle of tilt of the secondary lifting mechanism relative

25 to the main body, and which secondary tilt enabling joint is

such that the secondary lifting mechanism can be tilted in a controlled manner in a lateral direction with respect to the main body of the aircraft during flight of the aircraft that is opposite to a lateral direction that the primary lifting mechanism can be tilted in with respect to the main body of the aircraft by means of the primary tilt enabling joint during flight of the aircraft,

and the secondary

lifting mechanism is a turboprop, which secondary lifting mechanism is attached to the secondary tilt enabling joint such that air can be forced in a downward direction by the secondary lifting mechanism, and such that by forcing air in a downward direction the secondary lifting mechanism is able to exert an upward force on the aft end of the main body of the aircraft, and which secondary lifting mechanism is able to exert an upward force on the aft end of the main body of the aircraft through the secondary tilt enabling joint,

with the primary tilt enabling joint and the

secondary tilt enabling joint connected to the main body of the aircraft, and with the aircraft able to achieve flight by means of an upward force exerted on the main body of the aircraft by the primary lifting mechanism forcing air in a downward direction and an upward force exerted on the main body of the aircraft by the secondary lifting mechanism

forcing air in a downward direction while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order, and with controlled lateral tilting of the primary lifting mechanism and the secondary lifting mechanism able to occur during flight while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order.

4. An aircraft with a main body, a primary lifting mechanism and a secondary lifting mechanism, which main body has a forward end and an aft end, with the primary lifting mechanism and the secondary lifting mechanism connected to the main body of the aircraft in tandem order, and with the aircraft able to achieve flight by means of upward forces exerted on the main body of the aircraft by the primary lifting mechanism and the secondary lifting mechanism while the primary lifting mechanism and the secondary lifting mechanism are connected to the main body of the aircraft in tandem order,

15 and which primary lifting mechanism comprises a rotor, an engine assembly, and a plurality of blades, with the said blades connected to the rotor, and which said engine assembly is able to rotate the said rotor, with the blades connected to the rotor such that when the rotor is rotated by the said engine assembly air can be forced in a

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downward direction by means of the blades rotating around the rotor, with the primary lifting mechanism able to exert an upward force on the forward end of the main body of the aircraft by forcing air in a

5 downward direction by way of the blades rotating around the rotor,

and which primary lifting mechanism is connected to the main body of the aircraft by a tilt enabling joint such that during flight of the aircraft the primary lifting mechanism

10 can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the primary lifting mechanism can be tilted in lateral directions relative to the main body of the aircraft during flight of the aircraft, and such that a direction of

15 travel of the aircraft during flight can be altered by altering the lateral direction or angle of tilt of the primary lifting mechanism relative to the main body of the aircraft, and which said tilt enabling joint is a primary tilt enabling joint, with the primary lifting mechanism able to exert an

20 upward force on the forward end of the main body of the aircraft through the primary tilt enabling joint, and which secondary lifting mechanism is connected to the main body of the aircraft by an additional tilt enabling joint, which said additional tilt enabling joint is a secondary tilt enabling

25 joint, and which said secondary lifting mechanism is

connected to the main body of the aircraft by the secondary tilt enabling joint such that during flight of the aircraft the secondary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the secondary lifting mechanism can be tilted in lateral directions relative to the main body during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by altering the lateral direction or angle of tilt of the secondary lifting mechanism relative to the main body, and which secondary tilt enabling joint is such that the secondary lifting mechanism can be tilted in a controlled manner in a lateral direction with respect to the main body of the aircraft during flight of the aircraft that is opposite to a lateral direction that the primary lifting mechanism can be tilted in with respect to the main body of the aircraft by means of the primary tilt enabling joint during flight of the aircraft,

and the secondary lifting mechanism comprises at least one jet engine, which said at least one jet engine is attached to the secondary tilt enabling joint such that the said at least one jet engine is able to force exhaust gases to travel in a downward direction and such that by forcing exhaust gases to travel in a downward direction the said at least one jet engine can

exert an upward force on the aft end of the main body, and which secondary lifting mechanism is able to exert an upward force on the aft end of the main body of the aircraft through the secondary tilt enabling joint,

5 with the primary tilt enabling joint and the secondary tilt enabling joint connected to the main body of the aircraft, and with the aircraft able to achieve flight by means of an upward force exerted on the main body of the aircraft by the primary lifting mechanism forcing air in a

10 downward direction and an upward force exerted on the main body of the aircraft by the secondary lifting mechanism forcing exhaust gases to travel in a downward direction while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order, and with controlled lateral

15 tilting of the primary lifting mechanism and the secondary lifting mechanism able to occur during flight while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order.

5. The aircraft of claim 4 wherein the said at least one
20 jet engine is a turbojet.

6. The aircraft of claim 4 wherein the said at least one jet engine is a turbofan.

7. An aircraft with a main body, a primary lifting mechanism and a secondary lifting mechanism, which main body has a forward end and an aft end, with the primary lifting mechanism and the secondary lifting mechanism connected to the main body of the aircraft in tandem order, and with the aircraft able to achieve flight by means of upward forces exerted on the main body of the aircraft by the primary lifting mechanism and the secondary lifting mechanism while the primary lifting mechanism and the secondary lifting mechanism are connected to the main body of the aircraft in tandem order,

10 and which primary lifting mechanism is connected to the main body of the aircraft by a tilt enabling joint such that during flight of the aircraft the primary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the primary lifting mechanism can be tilted in lateral directions relative to the main body of the aircraft during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by

15 altering the lateral direction or angle of tilt of the primary lifting mechanism relative to the main body of the aircraft, and which said tilt enabling joint is a primary tilt enabling joint, with the primary lifting mechanism able to exert an upward force on the forward end of the main body of the

20 aircraft through the primary tilt enabling joint, and which

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secondary lifting mechanism is connected to the main body of the aircraft by an additional tilt enabling joint, which said additional tilt enabling joint is a secondary tilt enabling joint, and which said secondary lifting mechanism is

5 connected to the main body of the aircraft by the secondary tilt enabling joint such that during flight of the aircraft the secondary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the secondary

10 lifting mechanism can be tilted in lateral directions relative to the main body during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by altering the lateral direction or angle of tilt of the secondary lifting mechanism relative

15 to the main body, and which secondary tilt enabling joint is such that the secondary lifting mechanism can be tilted in a controlled manner in a lateral direction with respect to the main body of the aircraft during flight of the aircraft that is opposite to a lateral direction that the primary lifting

20 mechanism can be tilted in with respect to the main body of the aircraft by means of the primary tilt enabling joint during flight of the aircraft, and which secondary lifting mechanism is able to exert an upward force on the aft end of the main body of the aircraft through the secondary tilt enabling joint, with the primary tilt enabling joint and the

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secondary tilt enabling joint connected to the main body of the aircraft, and with the aircraft able to achieve flight by means of an upward force exerted on the main body of the aircraft by the primary lifting mechanism through the primary tilt enabling joint and an upward force exerted on the main body of the aircraft by the secondary lifting mechanism through the secondary tilt enabling joint while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order, and with controlled lateral tilting of the primary lifting mechanism and the secondary lifting mechanism able to occur during flight while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order.

8. An aircraft with a main body, a primary lifting mechanism and a secondary lifting mechanism, which main body has a forward end and an aft end, with the primary lifting mechanism and the secondary lifting mechanism connected to the main body of the aircraft in tandem order, and with the aircraft able to achieve flight by means of upward forces exerted on the main body of the aircraft by the primary lifting mechanism and the secondary lifting mechanism while the primary lifting mechanism and the secondary lifting mechanism are connected to the main body of the aircraft in tandem order,

10 and which primary lifting mechanism is connected to the main body of the aircraft by a tilt enabling joint such that during flight of the aircraft the primary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the primary lifting mechanism can be tilted in lateral directions relative to the main body of the aircraft during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by

15 altering the lateral direction or angle of tilt of the primary lifting mechanism relative to the main body of the aircraft, and which said tilt enabling joint is a primary tilt enabling joint,

20 which primary lifting mechanism is a turboprop, and which primary lifting

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mechanism is attached to the primary tilt enabling joint such that air can be forced in a downward direction by the primary lifting mechanism, and such that by forcing air in a downward direction the primary lifting mechanism is able 5 to exert an upward force on the forward end of the main body of the aircraft, with the primary lifting mechanism able to exert an upward force on the forward end of the main body of the aircraft through the primary tilt enabling joint,

10 and which secondary lifting mechanism is connected to the main body of the aircraft by an additional tilt enabling joint, which said additional tilt enabling joint is a secondary tilt enabling joint, and which said secondary lifting mechanism is connected to the main body of the aircraft by the secondary tilt enabling joint such 15 that during flight of the aircraft the secondary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the secondary lifting mechanism can be tilted in lateral directions 20 relative to the main body during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by altering the lateral direction or angle of tilt of the secondary lifting mechanism relative 25 to the main body, and which secondary tilt enabling joint is

such that the secondary lifting mechanism can be tilted in a controlled manner in a lateral direction with respect to the main body of the aircraft during flight of the aircraft that is opposite to a lateral direction that the primary lifting mechanism can be tilted in with respect to the main body of the aircraft by means of the primary tilt enabling joint during flight of the aircraft,

5 and the secondary lifting mechanism comprises at least one jet engine, which said at least one jet engine is attached to the secondary tilt enabling joint such that the said at least one jet engine is able to force exhaust gases to travel in a downward direction and such that by forcing exhaust gases to travel in a downward direction the said at least one jet engine

10 can exert an upward force on the aft end of the main body, and which secondary lifting mechanism is able to exert an upward force on the aft end of the main body of the aircraft through the secondary tilt enabling joint, with the primary tilt enabling joint and the

15 secondary tilt enabling joint connected to the main body of the aircraft, and with the aircraft able to achieve flight by means of an upward force exerted on the main body of the aircraft by the primary lifting mechanism forcing air in a downward direction and an upward force exerted on the main body of the aircraft by the secondary lifting mechanism

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forcing exhaust gases to travel in a downward direction while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order, and with controlled lateral tilting of the primary lifting mechanism and the 5 secondary lifting mechanism able to occur during flight while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order.

9. The aircraft of claim 8 wherein the said at least one jet engine is a turbojet.

10 10. The aircraft of claim 8 wherein the said at least one jet engine is a turbofan.

11. An aircraft with a main body, a primary lifting mechanism and a secondary lifting mechanism, which main body has a forward end and an aft end, with the primary lifting mechanism and 15 the secondary lifting mechanism connected to the main body of the aircraft in tandem order, and with the aircraft able to achieve flight by means of upward forces exerted on the main body of the aircraft by the primary lifting mechanism and the secondary lifting mechanism while the primary lifting mechanism and the secondary lifting mechanism are connected 20 to the main body of the aircraft in tandem order, and which primary lifting mechanism comprises a rotor, an engine assembly, and a

plurality of blades, with the said blades connected to the rotor, and which said engine assembly is able to rotate the said rotor, with the blades connected to the rotor such that when the rotor is rotated by the said engine assembly 5 air can be forced in a downward direction by means of the blades rotating around the rotor, with the primary lifting mechanism able to exert an upward force on the forward end of the main body of the aircraft by forcing air in a downward direction by way of the blades rotating 10 around the rotor,

and which primary lifting mechanism is connected to the main body of the aircraft by a tilt enabling joint such that during flight of the aircraft the primary lifting mechanism can be tilted in a plurality of directions and angles relative 15 to the main body of the aircraft, in a controlled manner, and such that the primary lifting mechanism can be tilted in lateral directions relative to the main body of the aircraft during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by 20 altering the lateral direction or angle of tilt of the primary lifting mechanism relative to the main body of the aircraft, and which said tilt enabling joint is a primary tilt enabling joint, with the primary lifting mechanism able to exert an upward force on the forward end of the main body of the 25 aircraft through the primary tilt enabling joint, and which

secondary lifting mechanism is connected to the main body of the aircraft by an additional tilt enabling joint, which said additional tilt enabling joint is a secondary tilt enabling joint, and which said secondary lifting mechanism is connected to the main body of the aircraft by the secondary tilt enabling joint such that during flight of the aircraft the secondary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the secondary lifting mechanism can be tilted in lateral directions relative to the main body during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by altering the lateral direction or angle of tilt of the secondary lifting mechanism relative to the main body, and which secondary tilt enabling joint is such that the secondary lifting mechanism can be tilted in a controlled manner in a lateral direction with respect to the main body of the aircraft during flight of the aircraft that is opposite to a lateral direction that the primary lifting mechanism can be tilted in with respect to the main body of the aircraft by means of the primary tilt enabling joint during flight of the aircraft,

and the secondary lifting mechanism is a turboprop, which secondary lifting mechanism is attached to the secondary tilt enabling joint such

that air can be forced in a downward direction by the secondary lifting mechanism, and such that by forcing air in a downward direction the secondary lifting mechanism is able to exert an upward force 5 on the aft end of the main body of the aircraft, and which secondary lifting mechanism is able to exert an upward force on the aft end of the main body of the aircraft through the secondary tilt enabling joint, with the primary tilt enabling joint and the 10 secondary tilt enabling joint connected to the main body of the aircraft, and with the aircraft able to achieve flight by means of an upward force exerted on the main body of the aircraft by the primary lifting mechanism forcing air in a downward direction and an upward force exerted on the main 15 body of the aircraft by the secondary lifting mechanism forcing air in a downward direction while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order, and with controlled lateral tilting of the primary lifting mechanism and the secondary 20 lifting mechanism able to occur during flight while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order.

12. An aircraft with a main body, a primary lifting mechanism and a secondary lifting mechanism, which main body has a forward end and an aft end, with the primary lifting mechanism and the secondary lifting mechanism connected to the main body of the aircraft in tandem order, and with the aircraft able to achieve flight by means of upward forces exerted on the main body of the aircraft by the primary lifting mechanism and the secondary lifting mechanism while the primary lifting mechanism and the secondary lifting mechanism are connected to the main body of the aircraft in tandem order,

5 and which primary lifting mechanism is connected to the main body of the aircraft by a tilt enabling joint such that during flight of the aircraft the primary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the primary lifting mechanism can be tilted in lateral directions relative to the main body of the aircraft during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by

10 15 20 25 altering the lateral direction or angle of tilt of the primary lifting mechanism relative to the main body of the aircraft, and which said tilt enabling joint is a primary tilt enabling joint,

which primary lifting mechanism is a turboprop, and which primary lifting mechanism is

attached to the primary tilt enabling joint such that air can be forced in a downward direction by the primary lifting mechanism, and such that by forcing air in a downward direction the primary lifting mechanism is able

5 to exert an upward force on the forward end of the main body of the aircraft, with the primary lifting mechanism able to exert an upward force on the forward end of the main body of the aircraft through the primary tilt enabling joint, and which secondary lifting mechanism is

10 connected to the main body of the aircraft by an additional tilt enabling joint, which said additional tilt enabling joint is a secondary tilt enabling joint, and which said secondary lifting mechanism is connected to the main body of the aircraft by the secondary

15 tilt enabling joint such that during flight of the aircraft the secondary lifting mechanism can be tilted in a plurality of directions and angles relative to the main body of the aircraft, in a controlled manner, and such that the secondary lifting mechanism can be tilted in lateral directions

20 relative to the main body during flight of the aircraft, and such that a direction of travel of the aircraft during flight can be altered by altering the lateral direction or angle of tilt of the secondary lifting mechanism relative to the main body, and which secondary tilt enabling joint is

25 such that the secondary lifting mechanism can be tilted in a

controlled manner in a lateral direction with respect to the main body of the aircraft during flight of the aircraft that is opposite to a lateral direction that the primary lifting mechanism can be tilted in with respect to the main body of the aircraft by means of the primary tilt enabling joint during flight of the aircraft,

5 and which secondary lifting mechanism comprises a rotor, an engine assembly, and a plurality of blades, with the blades of the secondary

10 lifting mechanism connected to the rotor of the secondary lifting mechanism, and which engine assembly of the secondary lifting mechanism is able to rotate the rotor of the secondary lifting mechanism, with the blades of the secondary lifting mechanism connected to the rotor of the secondary lifting mechanism such that when the rotor of

15 the secondary lifting mechanism is rotated by the engine assembly of the secondary lifting mechanism air can be forced in a downward direction by means of the blades of the secondary lifting mechanism rotating around the rotor of the secondary lifting mechanism, with the secondary

20 lifting mechanism able to exert an upward force on the aft end of the main body of the aircraft by forcing air in a downward direction by way of the blades of the secondary lifting mechanism rotating around the rotor of the

25 secondary lifting mechanism, and which secondary lifting

mechanism is able to exert an upward force on the aft end of the main body of the aircraft through the secondary tilt enabling joint, with the primary tilt enabling joint and the secondary tilt enabling joint connected to the main body of the aircraft, and with the aircraft able to achieve flight by means of an upward force exerted on the main body of the aircraft by the primary lifting mechanism forcing air in a downward direction and an upward force exerted on the main body of the aircraft by the secondary lifting mechanism forcing air in a downward direction while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order, and with controlled lateral tilting of the primary lifting mechanism and the secondary lifting mechanism able to occur during flight while the primary lifting mechanism and the secondary lifting mechanism are maintained in tandem order.

13. The aircraft of claim 2 wherein the engine assembly of the primary lifting mechanism comprises a single engine and the engine assembly of the secondary lifting mechanism comprises a single engine.

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14. The aircraft of claim 2 wherein the engine assembly of the primary lifting mechanism comprises a plurality of engines and the engine assembly of the secondary lifting mechanism comprises a single engine.

15. The aircraft of claim 2 wherein the engine assembly of the primary lifting mechanism comprises a single engine and the engine assembly of the secondary lifting mechanism comprises a plurality of engines.
- 5 16. The aircraft of claim 2 wherein the engine assembly of the primary lifting mechanism comprises a plurality of engines and the engine assembly of the secondary lifting mechanism comprises a plurality of engines.
17. The aircraft of claim 4 wherein the engine assembly of the primary lifting mechanism comprises a single engine.
- 10 18. The aircraft of claim 4 wherein the engine assembly of the primary lifting mechanism comprises a plurality of engines.
19. The aircraft of claim 11 wherein the engine assembly of the primary lifting mechanism comprises a single engine.
- 15 20. The aircraft of claim 11 wherein the engine assembly of the primary lifting mechanism comprises a plurality of engines.
21. The aircraft of claim 12 wherein the engine assembly of the secondary lifting mechanism comprises a single engine.
22. The aircraft of claim 12 wherein the engine assembly of the secondary lifting mechanism comprises a plurality of engines.

23. The aircraft of any one of claims 1 to 22 wherein
the primary lifting mechanism and the secondary lifting
mechanism are connected to the main body of the aircraft
such that the primary lifting mechanism is further forward
5 with respect to the main body of the aircraft than is the
position of the secondary lifting mechanism with respect to
the main body of the aircraft.

24. The aircraft of any one of claims 1 to 23 wherein
the primary lifting mechanism is connected to the main body
10 of the aircraft by means of the primary tilt enabling joint
such that the primary lifting mechanism can be tilted in a
forward direction and a rearward direction relative to the
main body of the aircraft, in a controlled manner, by means
of the primary tilt enabling joint.

15 25. The aircraft of any one of claims 1 to 24 wherein the
secondary lifting mechanism is connected to the main body
of the aircraft by means of the secondary tilt enabling
joint such that the secondary lifting mechanism can be
tilted in a forward and a rearward direction relative to the
20 main body of the aircraft, in a controlled manner, by means
of the secondary tilt enabling joint.

26. The aircraft of any one of claims 1 to 25 wherein
the primary lifting mechanism is connected to the main body
by the primary tilt enabling joint such that the primary
lifting mechanism can be positioned above the main body of
5 the aircraft by means of the primary tilt enabling joint
during flight of the aircraft.

27. The aircraft of any one of claims 1 to 25 wherein
the primary lifting mechanism is connected to the main body
of the aircraft by the primary tilt enabling joint such that
10 only a part of the primary lifting mechanism can be positioned
above the main body of the aircraft by means of the primary
tilt enabling joint during flight of the aircraft.

28. The aircraft of any one of claims 1 to 27 wherein
the primary lifting mechanism is connected to the main body
15 of the aircraft by the primary tilt enabling joint such that
the primary lifting mechanism can be positioned in front of
the main body of the aircraft by means of the primary tilt
enabling joint during flight of the aircraft.

29. The aircraft of any one of claims 1 to 27 wherein
20 the primary lifting mechanism is connected to the main body
of the aircraft by the primary tilt enabling joint such that
only a part of the primary lifting mechanism can be positioned
in front of the main body of the aircraft by means of the
primary tilt enabling joint during flight of the aircraft.

30. The aircraft of any one of claims 1 to 27 wherein
by means of the primary tilt enabling joint the primary
lifting mechanism can be placed in a position such that no
part of the primary lifting mechanism is in front of the
5 main body of the aircraft.

31. The aircraft of any one of claims 1 to 30 wherein the
secondary lifting mechanism is connected to the main body of
the aircraft by the secondary tilt enabling joint such that the
secondary lifting mechanism can be positioned above the aft
10 end of the main body of the aircraft by means of the
secondary tilt enabling joint during flight of the aircraft.

32. The aircraft of any one of claims 1 to 30 wherein
the secondary lifting mechanism is connected to the main body
of the aircraft by the secondary tilt enabling joint such
15 that only a part of the secondary lifting mechanism can
be positioned above the main body of the aircraft by means of
the secondary tilt enabling joint during flight of the aircraft.

33. The aircraft of any one of claims 1 to 32 wherein
the secondary lifting mechanism is connected to the main body
20 of the aircraft by the secondary tilt enabling joint such that
the secondary lifting mechanism can be positioned behind the
main body of the aircraft by means of the secondary tilt
enabling joint during flight of the aircraft.

34. The aircraft of any one of claims 1 to 32 wherein
the secondary lifting mechanism is connected to the main body
of the aircraft by the secondary tilt enabling joint such that
only a part the secondary lifting mechanism can be positioned
5 behind the main body of the aircraft by means of the secondary
tilt enabling joint during flight of the aircraft.

35. The aircraft of any one of claims 1 to 32 wherein
by means of the secondary tilt enabling joint the secondary
lifting mechanism can be placed in a position such that no
10 part of the secondary lifting mechanism is in behind of the
main body of the aircraft.

36. The aircraft of any one of claims 1 to 35 wherein
the primary tilt enabling joint comprises a movement enabling
assembly that enables the primary tilt enabling joint to
15 move and a tilt activating mechanism that can cause and
control the movement of the primary tilt enabling joint,
and the secondary tilt enabling joint comprises a movement
enabling assembly that allows the secondary tilt enabling
joint to move and a tilt activating mechanism that causes
20 and controls the movement of the secondary tilt enabling
joint to occur, which movement enabling assembly of the
secondary tilt enabling joint is a secondary movement
enabling assembly, and which said tilt activating mechanism
of the secondary tilt enabling joint is a secondary tilt
25 activating mechanism.

37. The aircraft of claim of 36 wherein the movement enabling assembly of the primary tilt enabling joint is a universal joint and the tilt activating mechanism of the primary tilt enabling joint comprises a plurality of hydraulic actuators connected to the universal joint of the primary tilt enabling joint.

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38. The aircraft of claim of 36 wherein the movement enabling assembly of the primary tilt enabling joint comprises a plurality of hinges transversely connected to one another and the tilt activating mechanism of the primary tilt enabling joint comprises a plurality of hydraulic actuators connected to the movement enabling assembly of the primary tilt enabling joint.

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39. The aircraft of any one of claims 1 to 38 wherein the movement enabling assembly of the secondary tilt enabling joint is a universal joint, with the tilt activating mechanism of the secondary tilt enabling joint comprising a plurality of hydraulic actuators connected to the universal joint of the secondary tilt enabling joint.

15

40. The aircraft of any one of claims 1 to 38 wherein
the movement enabling assembly of the secondary tilt
enabling joint comprises a plurality of hinges transversely
connected to one another with the tilt activating mechanism
5 of the secondary tilt enabling joint comprising a plurality
of hydraulic actuators connected to the movement enabling
assembly of the secondary tilt enabling joint.

41. The aircraft of any one of claims 1 to 35 wherein
the primary tilt enabling joint comprises a plurality of
10 movement enabling assemblies that enable the primary tilt
enabling joint to have a tilt motion and a plurality of tilt
activating mechanisms that can cause and control the movement
of the primary tilt enabling joint, and the secondary tilt
enabling joint comprises a plurality of movement enabling
15 assemblies that allow the secondary tilt enabling joint to
move and a plurality of tilt activating mechanisms that can
cause and control the movement of the secondary tilt enabling
joint.

42. The aircraft of any one of claims 1 to 41 wherein
20 the secondary lifting mechanism is connected to the
the secondary tilt enabling joint by a rotating mechanism
such that during flight of the aircraft the secondary lifting
mechanism can be rotated in a controlled manner relative to
the secondary tilt enabling joint by means of the rotating
25 mechanism.

43. The aircraft of any one of claims 1 to 41 wherein
the secondary tilt enabling joint is connected to the main
body of the aircraft by a rotating mechanism such that during
flight of the aircraft the secondary tilt enabling joint can
5 be rotated relative to the main body of the aircraft in a
controlled manner by means of the rotating mechanism.

44. The aircraft of any one of claims 4, 5, 6, 8, 9 or 10 wherein
a fin is connected to the secondary lifting mechanism such that
the fin protrudes outward from the secondary lifting mechanism.

10 45. The aircraft of any one of claims 1 to 44 wherein the primary
tilt enabling joint is connected to the main body of the
aircraft by a tilt enabling joint, which said tilt enabling
joint that connects the primary tilt enabling joint to the
main body is a third tilt enabling joint, and which said
15 third tilt enabling joint is such that the primary tilt
enabling joint can be tilted in a plurality of directions
and angles relative to the main body of the aircraft, in a
controlled manner, by means of the third tilt enabling joint.

46. The aircraft of claim 45 wherein the third tilt enabling
20 joint is such that the primary tilt enabling joint
can be tilted in a plurality of directions and angles
relative to the main body of the aircraft, in a controlled
manner, by means of the third tilt enabling joint without
components of the primary tilt enabling joint having to move
25 with respect to one another.

47. The aircraft of any one of claims 45 or 46 wherein
the third tilt enabling joint comprises a movement enabling
assembly that enables the third tilt enabling joint to move
and a tilt activating mechanism that can cause and control
5 the movement of the third tilt enabling joint.

48. The aircraft of claim 47 wherein the
movement enabling assembly of the third tilt enabling joint
comprises a universal joint and the tilt activating
comprises a plurality of hydraulic actuators.

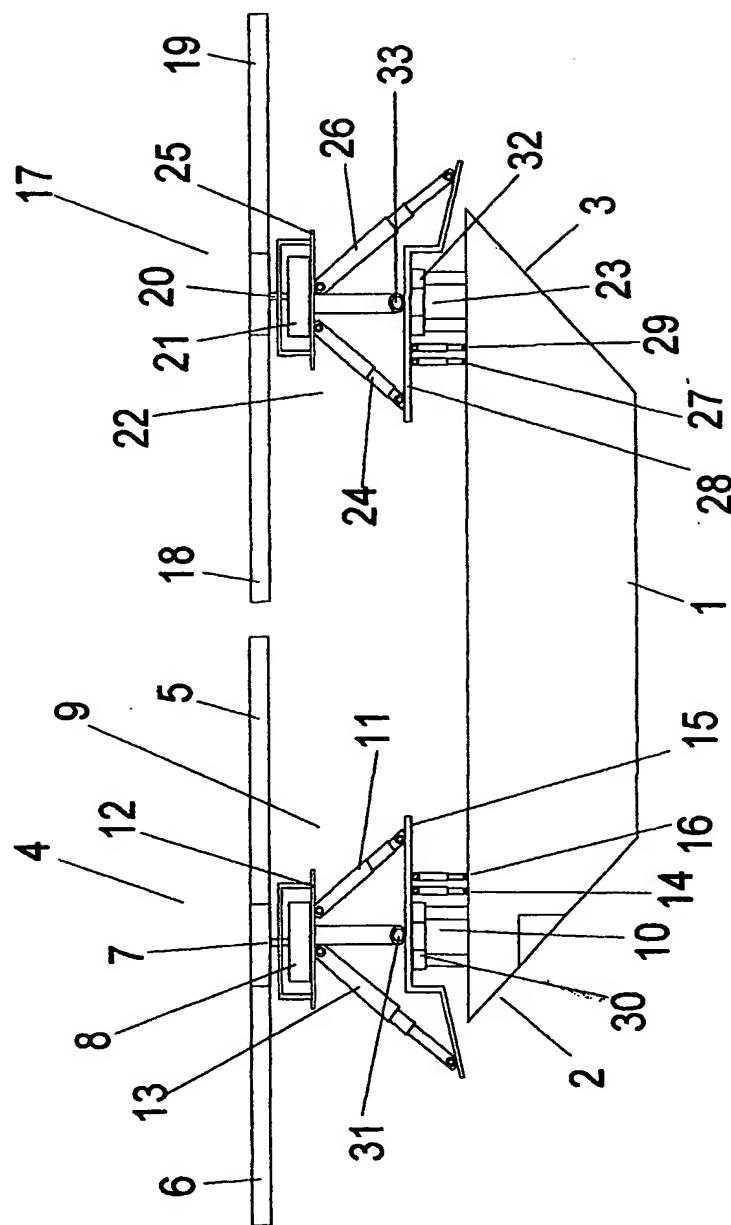


FIG. 1

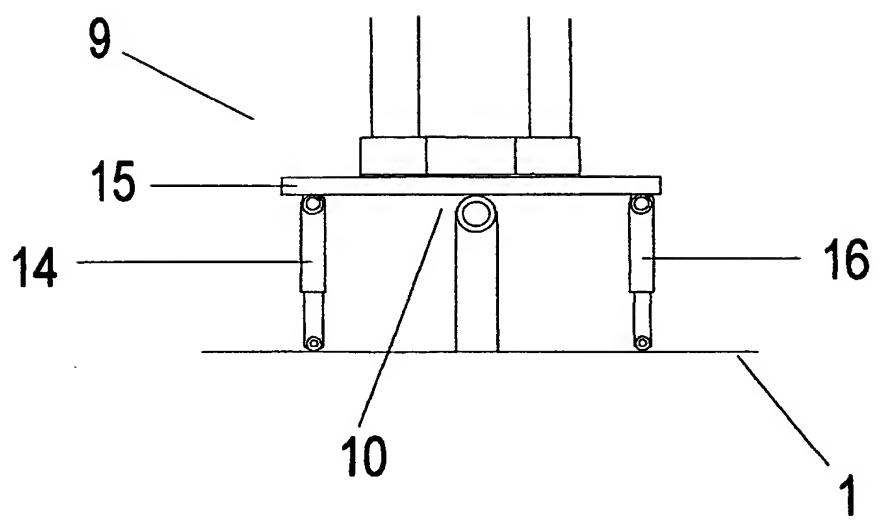


FIG. 2

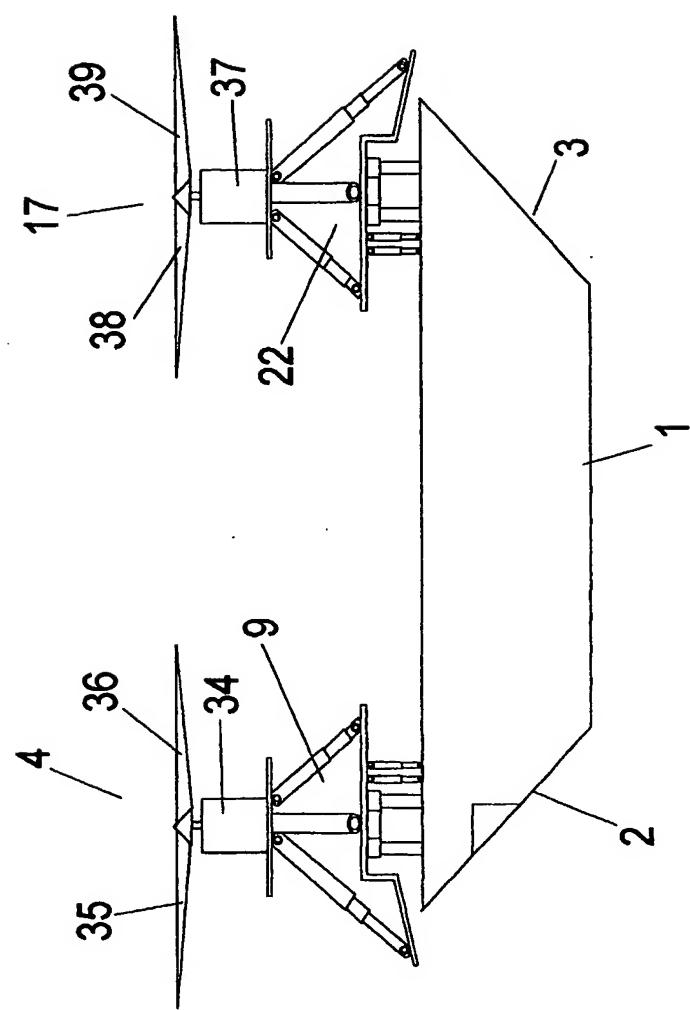


FIG. 3

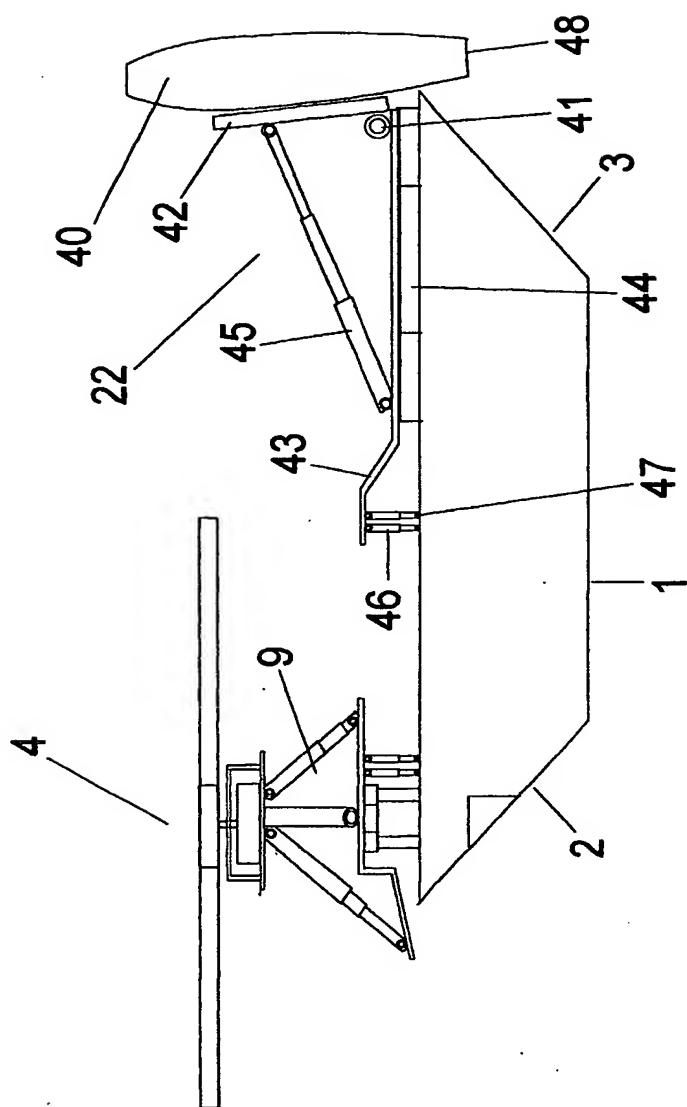


FIG. 4

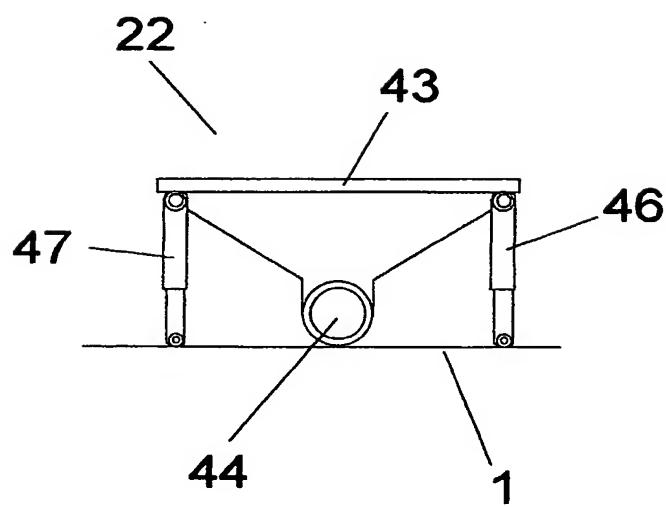


FIG. 5

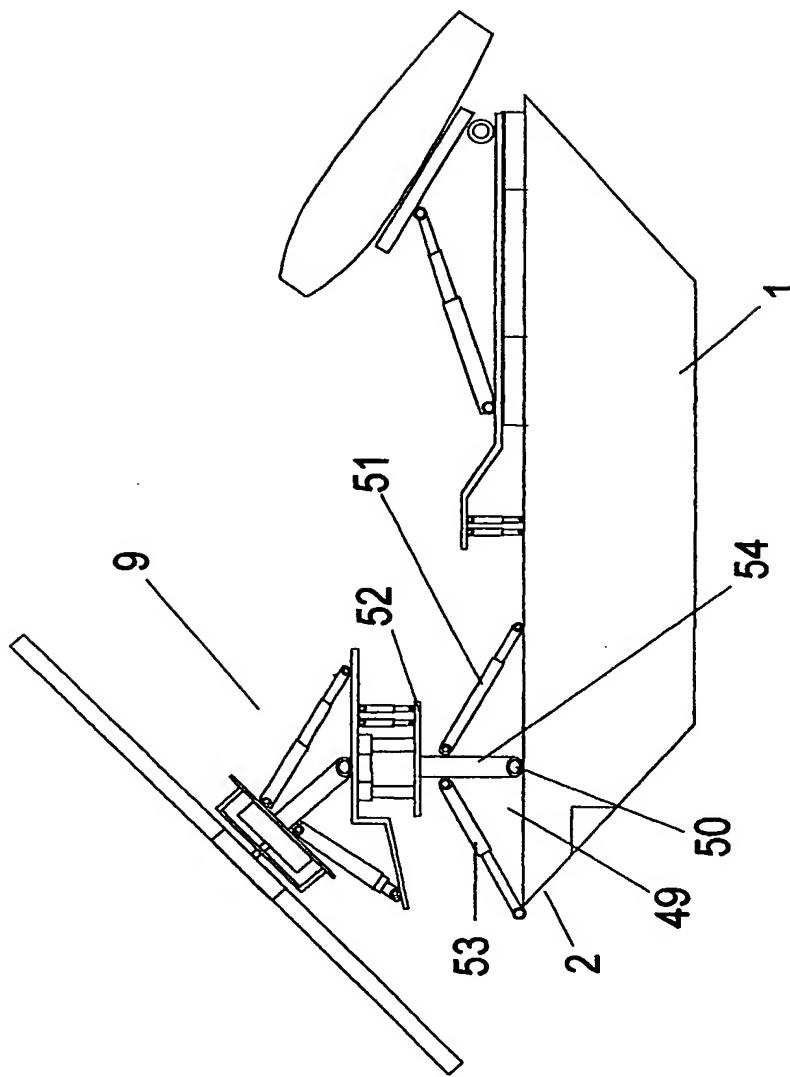


FIG. 6

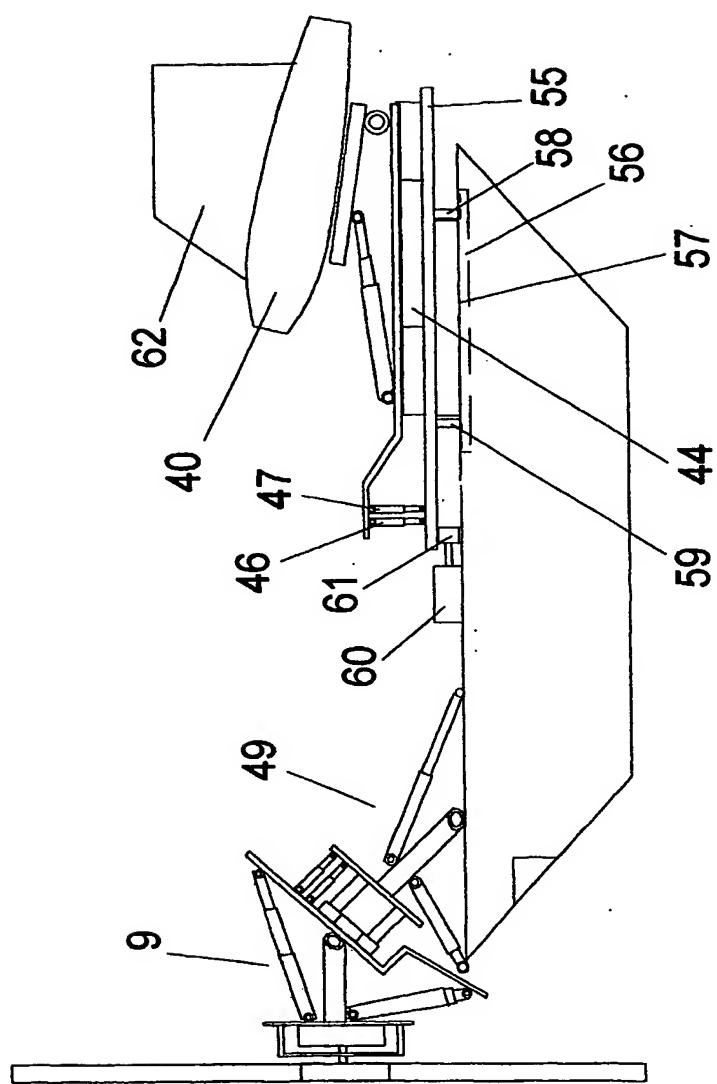


FIG. 7

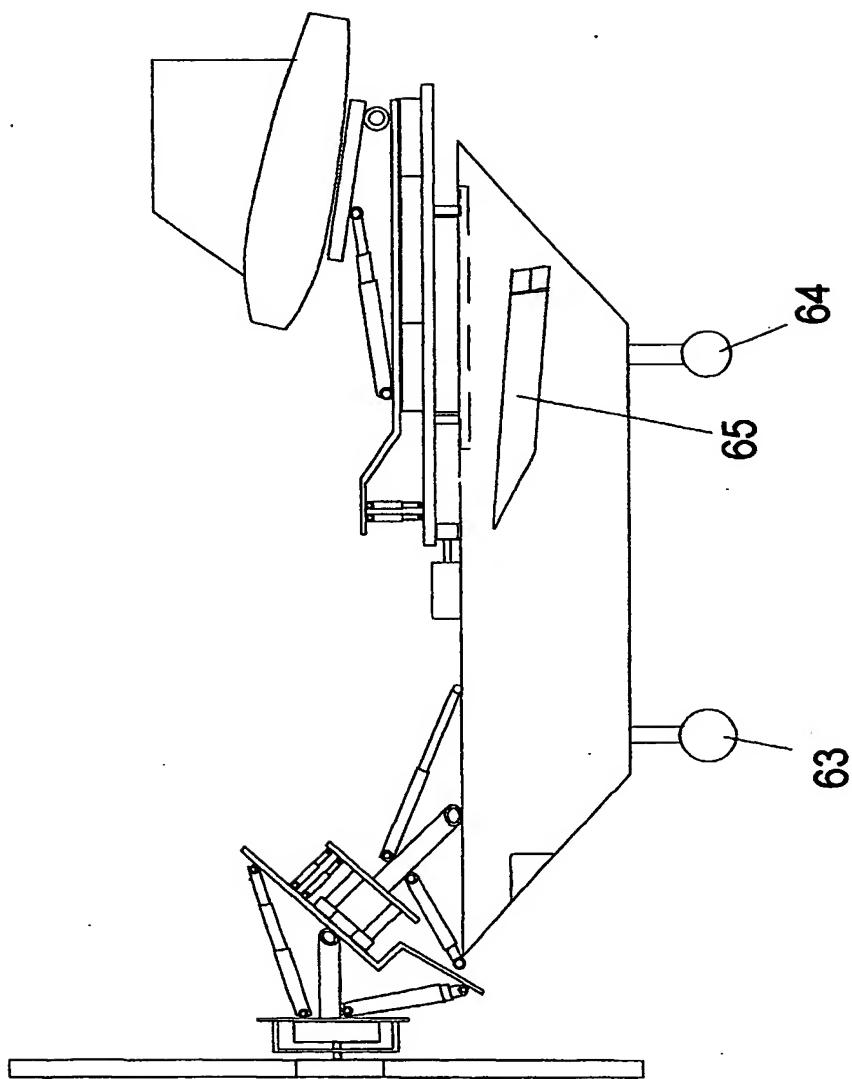


FIG. 8

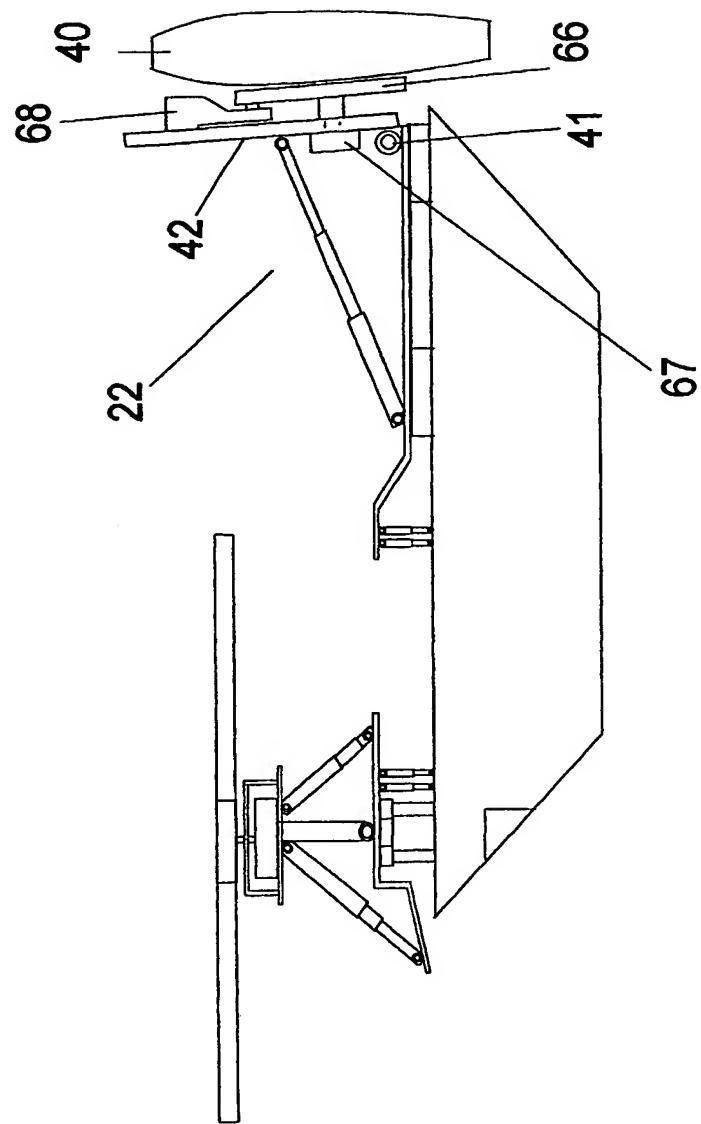


FIG. 9

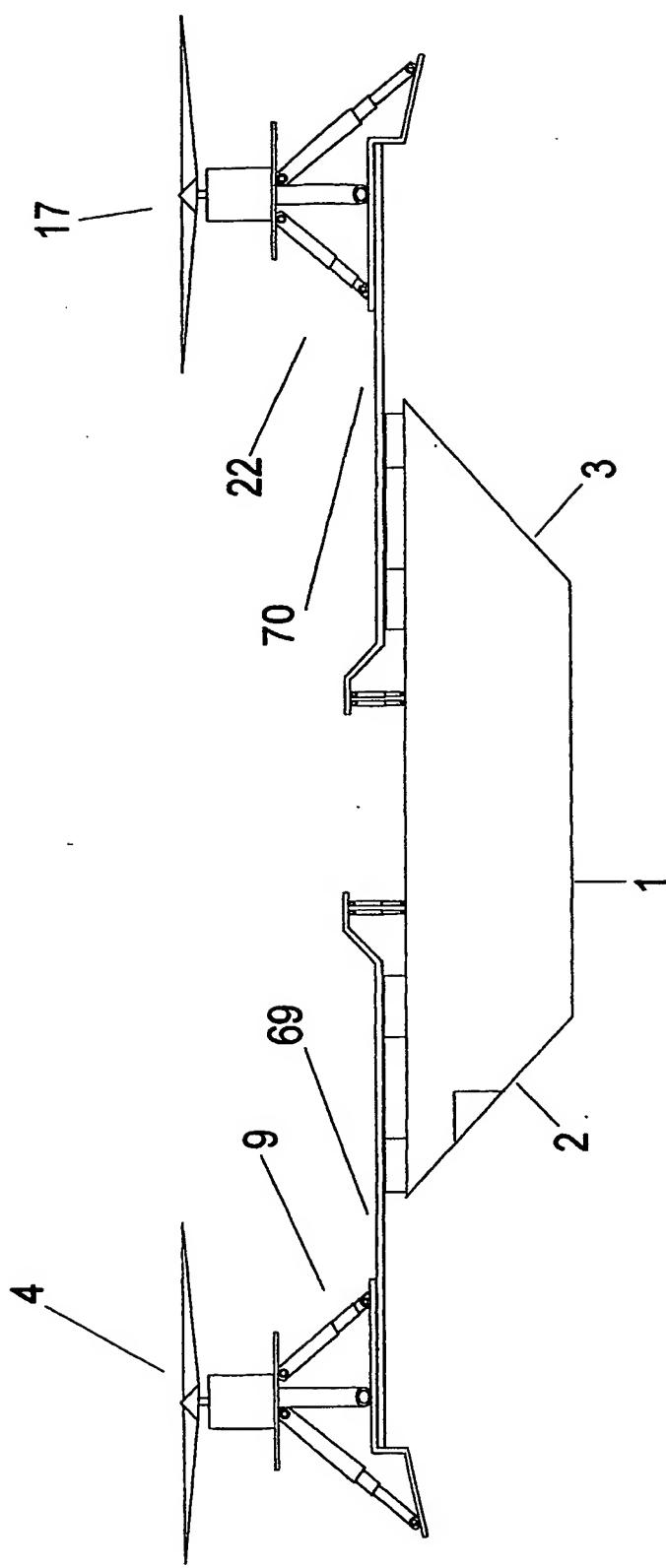


FIG. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU03/00816

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl. 7: B64C 27/08, 27/28, 27/52, 29/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) Refer to electronic data bases consulted below.		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched AU: IPC B64C 27/08, 27/28, 27/52, 29/00		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) Derwent World Patent Index and esp@ce and USPTO Internet sites: IPC B64C 27/00, 27/08, 27/28, 27/52, 29/00 and/or keywords: pivot, tilt, rotor, jet, lift, tandem, twin, dual, second, aircraft, airplane, helicopter, and similar terms		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3905565 A (KOLWEY) 16 September 1975 See whole document, in particular lines 16-36 of column 5.	1-2, 7, 13-16, 23, 26, 30-31, 35-36
X	US 2233747 A (RIEDL) 4 March 1941 See whole document, in particular Fig 6 and lines 33-51 of the first column of page 3.	1-2, 7, 13-16, 23, 26, 30-31, 35-36
A	US 1491310 A (PERRIN) 22 April 1924	
<input type="checkbox"/> Further documents are listed in the continuation of Box C <input type="checkbox"/> See patent family annex		
<p>* Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&" document member of the same patent family</p>		
Date of the actual completion of the international search 15 August 2003	Date of mailing of the international search report 20 AUG 2003	
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